

REMARKS

With entry of the foregoing amendment, Claims 1-19 are pending in the application. Claims 1 and 9 are the base claims and have been amended to further clarify the invention. Support for the foregoing claim amendments are found at least in the originally filed Specification at page 2, lines 20-25. No new matter is introduced by way of these amendments.

Double Patenting Rejection

In the Office Action, the Examiner had rejected claims 1-10 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-17 of U.S. Patent Application No. 6,714,958. The Applicant is filing a terminal disclaimer herewith. The Applicant respectfully believes the terminal disclaimer overcomes this rejection and therefore respectfully requests that this rejection be withdrawn.

Rejections of Claims Under 35 U.S.C. § 112, Second Paragraph

Claims 1-10 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

In an effort to expedite prosecution, Applicant has amended base Claims 1 and 9, in relevant part, “suspending the first thread is in response to the first thread’s request for the synchronization object that could result in a deadlock if acquired so evidenced by existence if any thread currently holding but not having released the synchronization object while acquiring another synchronization object” to further clarify the invention. Support for the claim amendments are found throughout the originally filed Specification such as at page 2, lines 20-25.

In the Office Action on page 3 states, in part, “it is not clearly understood that there are how many thread.” According to amended Claims 1 and 9, there are clearly at least two threads, a “first thread” and a “second thread”. There may also be “any thread” which may refer to another thread other than the “first thread” and “second thread” or may refer to the “second thread.”

In the Office Action on page 4 states, in part, “receiving a request from a second thread to acquire the synchronization object ... and allowing ... the synchronization object (is the synchronization object refers to the second synchronization object.)” The amended Claims 1 and 9 make clear that the synchronization object requested by the “first thread” is also requested by the second thread (i.e. the same synchronization object).

Claims 2-8 and 19 depend from base Claim 1 and Claims 10-18 depend from base Claim 9. Accordingly, Applicant respectfully submits that the rejection of Claims 1-10 under 35 U.S.C. § 112, paragraph 2 is believed to be overcome.

Rejections of Claims Under 35 U.S.C. § 101

Claims 9-10 have been rejected under 35 U.S.C. § 101. In support of this rejection, the Office Action states the claimed invention is not limited to tangible embodiments.

Applicant respectfully disagree. In an effort to expedite prosecution, Applicant has amended base Claim 9 and dependent Claim 10. Amended Claim 9 recites “A computer program product for analyzing multi-threaded programs, comprising: a computer useable medium having a computer readable program, wherein the computer readable program when executed on a computer causes the computer to” perform certain actions. Claim 10 has been amended to remove reference to any intangible embodiments. Accordingly, Applicant respectfully submits that the rejection of Claims 9-10 under 35 U.S.C. § 101 is believed to be overcome.

Rejections of Claims Under 35 U.S.C. § 103(a)

Claims 1-10 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Sager (U.S. Patent 6,542,921, hereinafter “Sager”).

Applicant discloses and claims in Claim 1,

A computer implemented method of analyzing multi-threaded programs, comprising:

suspending a first thread that requests a synchronization object that could result in a deadlock if acquired;

receiving a request from a second thread to acquire the synchronization object while the first thread is suspended;

allowing the second thread to acquire the synchronization object; and

causing the first thread to awake in response to an event message to potentially produce a deadlock;

wherein the method of suspending the first thread is in response to the first thread's request for the synchronization object that could result in a deadlock if acquired so evidenced by existence of any thread currently holding but not having released the synchronization object while acquiring another synchronization object.

As provided in MPEP 2143.01, "to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations."

The present invention relates to modifying the predisposed execution of a multi-threaded program to detect and cause latent deadlocks. When a first thread attempts to acquire a synchronization object, it is determined if in the last synchronization object was held by a thread at that time that acquired another synchronization object while still holding the subject synchronization object. If there is such a history of the subject synchronization object, then the first thread is suspended and may be awakened later by a second thread that has acquired the synchronization object. The newly awakened first thread may then attempt to acquire the synchronization object that is held by the second thread thereby increasing the likelihood that a latent deadlock will be caused and detected. The first thread is awakened upon receipt of a deadlock **event message**, or if upon expiration of a predetermined amount of time, which also sends a message to the thread to awaken. Thus, the first thread can be awakened by two different ways.

The Office Action concedes that Sager does not explicitly teach the step of awakening the first thread to potentially produce a deadlock. The Office action asserts that Sager teaches both threads are in the condition of circular wait and neither thread will release the resource it has, so the deadlock occurs. Applicant respectfully disagrees. In contrast to Applicant's invention as recited in now amended Claim 1, Sager assigns priority duration between threads to indicate which one of the two threads have priority, if both threads compete for a particular resource.

Sager, Column 10, lines 39-61 and Figure 9. The priority duration is defined as a duration or interval of time during which a particular thread is given processing priority. *Sager*, Column 11, lines 4-15 and Figure 9. Unlike *Sager*, Applicant specifically teaches causing the first thread to awake in response to an **event message** to potentially produce a deadlock.

For the reasons set forth above, Applicant respectfully submits *Sager* taken either individually or in combination does not render obvious the Applicant's claimed "A computer implemented method of analyzing multi-threaded programs, comprising: suspending a first thread that requests a synchronization object that could result in a deadlock if acquired; receiving a request from a second thread to acquire the synchronization object while the first thread is suspended; allowing the second thread to acquire the synchronization object; and causing the first thread to awake in response to an event message to potentially produce a deadlock; wherein the method of suspending the first thread is in response to the first thread's request for the synchronization object that could result in a deadlock if acquired so evidenced by existence if any thread currently holding but not having released the synchronization object while acquiring another synchronization object" as recited in base Claim 1. Therefore, Applicant respectfully requests that the above rejection to at least Claim 1 be withdrawn.

Independent Claim 9 include similar limitations as Claim 1. Therefore, for reasons described above, Claim 9 should also be allowed under 35 U.S.C. 103(a) over *Sager*.


Because Claims 2-8 and 19 depend from Claim 1 and Claims 11-18 depend on Claim 9, these claims should be allowed under 35 U.S.C. §103(a) for at least the same reasons. Withdrawal of the §103 rejection of Claims 1-10 is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.

By 
Mary Lou Wakimura
Registration No. 31,804
Telephone: (978) 341-0036
Facsimile: (978) 341-0136

Concord, MA 01742-9133

Dated: 10/18/06